



Grid Effects Research Activities

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PIER Goals

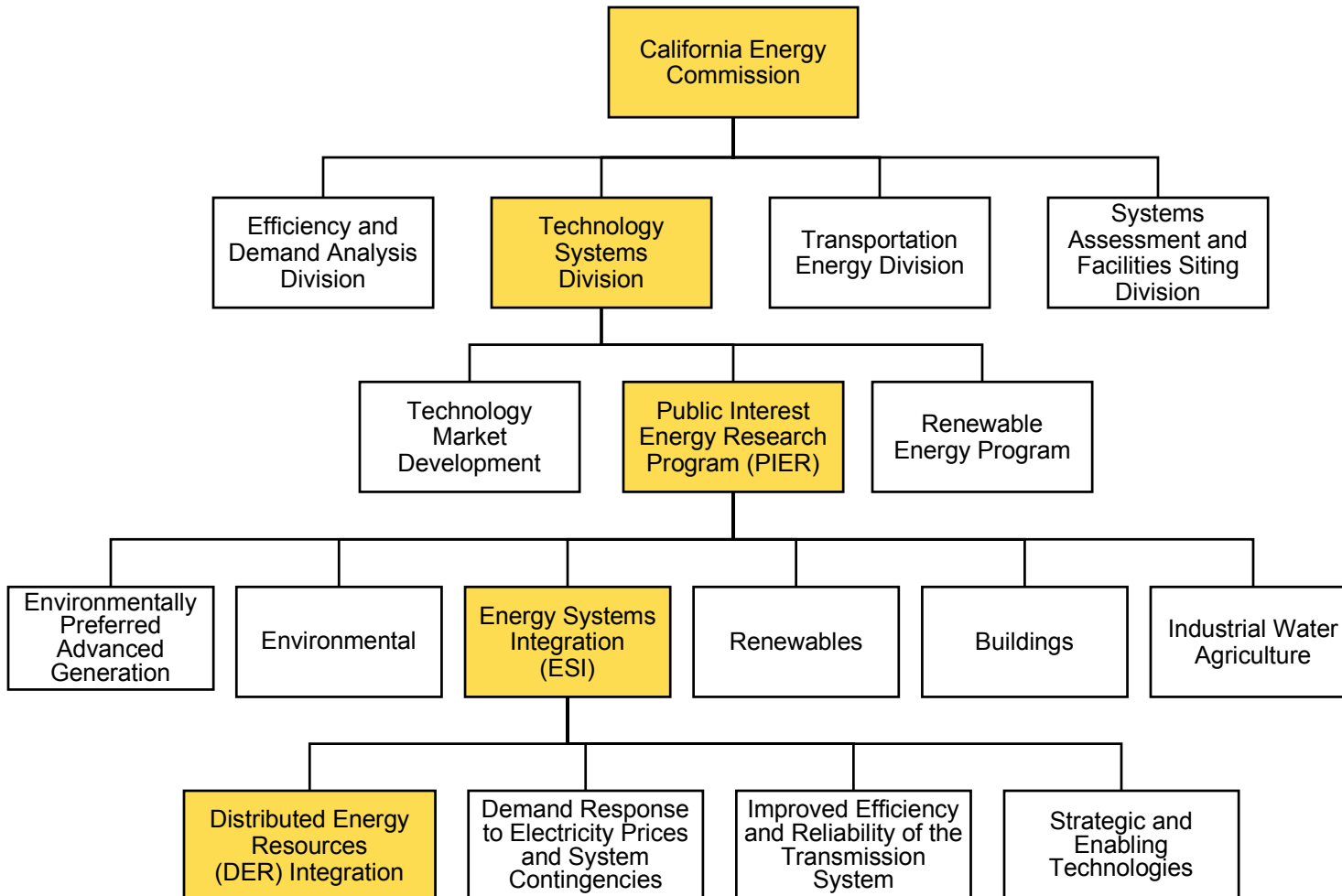


The Public Interest Energy Research (PIER) was established in 1996 as part of new legislation that includes a requirement that at least \$62.5 million be collected annually from investor-owned utility ratepayers for "public interest" energy research and development efforts that are not adequately provided by competitive and regulated markets.

PIER has 5 primary public benefit energy objectives. Research projects are considered for funding that, if implemented, produce technology, knowledge or procedures that will:

- Improve energy cost/value
- Improve the environment, public health and safety
- Improve electricity reliability, quality and sufficiency
- Strengthen the California economy
- Provide greater choices for California consumers

PIER ESI DER Activities



The ESI DER Integration program is focused on funding systems-level research and enabling RD&D in the areas of interconnection, grid effects and market integration.



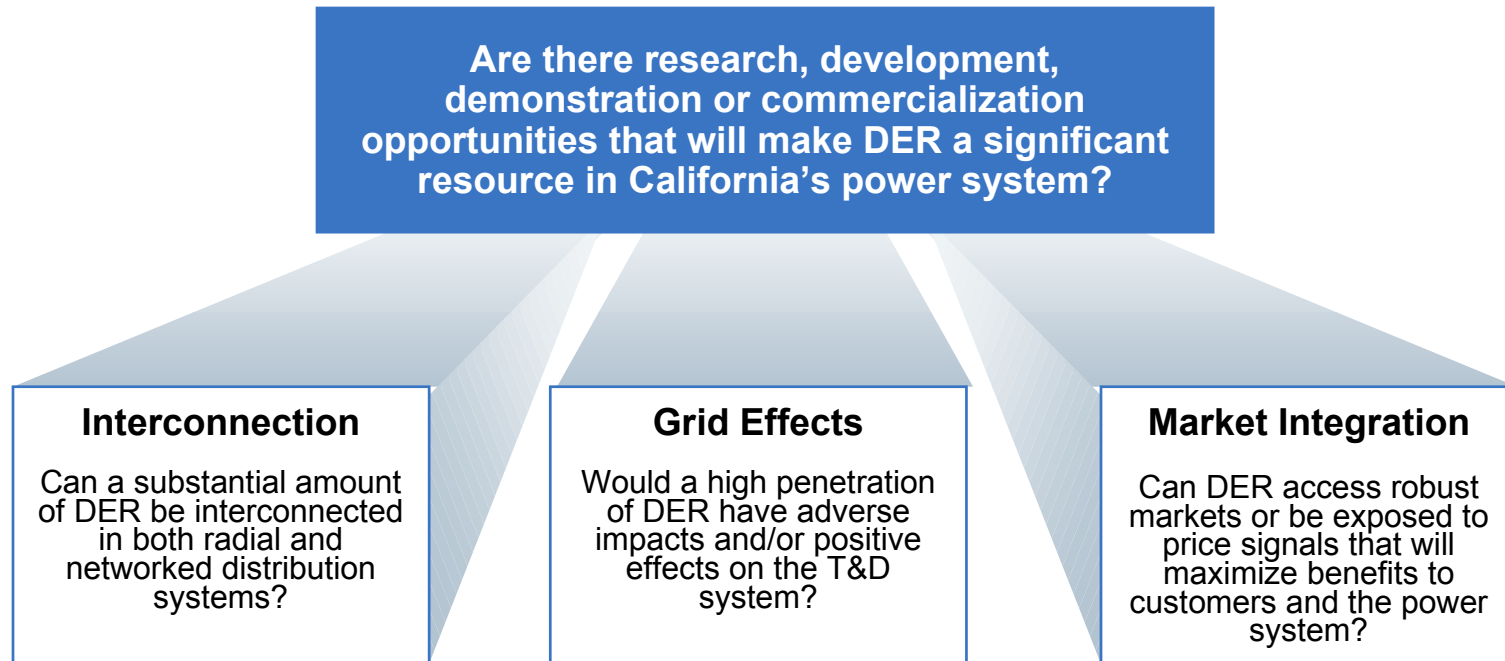
- Near-Term Research Objectives (<5 years)
 - Enable safe interconnection to grid
 - Determine limits of DER penetration into grid
 - Quantify and demonstrate grid benefits
 - Demonstrate novel approach of microgrids
- Mid-Term Research Objectives (5-10 years)
 - Optimize benefits/impacts of DER
 - Determine and enable market mechanisms to capture and monetize DER benefits



Conducted an assessment all national research and identified research initiatives appropriate for public funding and gaps in those initiatives.

- Defined research initiatives (i.e., clusters of research activities with a similar focus) in the areas of:
 - Interconnection
 - Grid Effects
 - Market Integration
- Identified current R&D projects in the private and public sectors for each research initiative
- Characterized size of gaps in research initiatives according to the level of research activity in each initiative (i.e., significant, moderate or little/no gap)
- Mapped research initiatives according to their stage of technology development (i.e., research, development, demonstration or commercialization) and their competitive impact (i.e., base, key, pacing or emerging)
- Identified as appropriate for public funding research initiatives that:
 - Had significant or moderate gaps
 - Were not in the commercial development stage
 - Had a competitive impact of emerging, pacing or base

We have identified overarching questions for the overall analysis and the three areas of interest.



Grid Effects Issues and Strategies



Grid Effects

Would a high penetration of DER have adverse and/or positive impacts on the T&D system?

Issues	Initiatives
<p>Do we understand what benefits DER can provide to the power system?</p> <p>Do we understand DER's impact on the grid?</p> <p>Do we understand how DER will interact with other DER and the grid in real-time?</p> <p>Is there a limit to the level of DER that the system can absorb without adverse impacts? Can we understand that limit?</p> <p>Are there limitations on bi-directional power?</p> <p>Should distribution design philosophy be modified to accommodate DER?</p>	<p>Modeling and Testing</p> <ul style="list-style-type: none"> • Model and analyze the grid with varying levels of DER penetration • Demonstrate and test varying levels of DER penetration in a distribution system • Modify distribution system design approaches
<p>Can engineering studies be eliminated, standardized or streamlined?</p>	<p>System Impact Studies</p> <ul style="list-style-type: none"> • Develop models to understand system impacts • Develop software to facilitate impact studies • Modify requirements for impact studies as appropriate
<p>Can microgrids be utilized effectively?</p> <p>Can the power system or the expansion thereof be built around microgrids?</p>	<p>Microgrids</p> <ul style="list-style-type: none"> • Model and analyze microgrids • Demonstrate and test microgrids • Develop design guidelines for microgrids
<p>Can we understand the information needs of wires companies with DER deployed in their systems?</p>	<p>Wires Company Information Needs</p> <ul style="list-style-type: none"> • Perform analysis of the information and data needs of wires companies • Develop and demonstrate systems for wires companies to monitor DER

Current Grid Effects Projects



ESI DER has promising research already in the pipeline. At present, the portfolio includes 10 projects with a total budget requirement for over \$6 million for the life of these projects.

Projects dealing with grid effects account for \$3.3 million:

- Distributed Utility Integration Test (DUIT)
 - Laboratory demonstration and testing of varying levels of DER in distribution systems
 - \$2.0M
 - Final Report completed by Fall 2003
- Regional Solutions Pilot - New Power Technologies
 - Developing integrated T&D modeling tools to assess locational benefits of real & reactive power insertions into a T&D system
 - \$616k
 - Research Results Workshop in Spring 2003
- Forging a Consensus on Interconnection Requirements in California (FOCUS)
 - Interconnection Monitoring Program
 - \$745k
 - Monitoring Data available within the month
 - Test Report completed March 2004

Contact Information



- Information Resources on Energy Commission Activities
 - Commission DG Strategic Plan
www.energy.ca.gov/reports/2002-06-12_700-02-002.PDF
 - Commission DG Webpage
www.energy.ca.gov/distgen/index.html
 - PIER Webpage
www.energy.ca.gov/pier/index.html
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